DESCRIPTION

Microplate and Method of Manufacturing Microplate

Technical Field

The present invention relates to a structure of a container and a method of manufacturing the same and, more specifically, to a structure of a microplate having a plurality of wells for storing samples to be observed in the field of biology, medical science, chemistry and the like and a method of manufacturing the same.

Background Art

In the related art, there is a microplate formed by adhering a plate having a light transmissible property on one of the surfaces of a plastic resin plate having a metal plate sandwiched therein. In such a microplate, since the metal plate has a good thermal conductivity, it is easy to heat or cool the samples in a state of being stored in the microplate or to provide the respective samples on the identical microplate temperature gradient, and is preferable in observation of samples based on a PCR (Polymerase Chain Reaction) method.

An example of the structure of such a microplate

in the related art is shown in Fig. 9.

In Fig. 9, (a) is a top view of such a microplate 1, (b) is a bottom view of the microplate 1, (c) is an enlarged top view of the microplate 1, and (d) is a cross-sectional view of the microplate 1 taken along an alternate long and short dash line shown as C-C in (c). In Figs. 9(a) and (b), an outer frame which does not relate to the present invention is omitted.

The microplate 1 includes cylindrical wells 2 arranged in rows and columns connected in a rectangular shape at regular intervals, as shown in Fig. 9(a) and (b).

Also, as shown in Fig. 9(d), the microplate 1 is formed by adhering a cover glass 4 having light transmissibility with adhesive on one surface of a resin plate 3.

The resin plate 3 is formed of resin 5, which is a plastic material. In the resin plate 3, there is provided an aluminum plate 6, and the aluminum plate 6 covered by resin 5 constitutes the resin plate 3. The aluminum plate 6 is formed with round holes of larger diameter than the inner diameter of the well 2 at intervals corresponding to the arrangement of the wells 2 so as to prevent the aluminum plate 6 from being exposed inside the well 2 and coming into direct contact with the samples.

In other words, the resin plate 3 is a plate shape member including the wells 2 connected with each other at the positions of the round holes provided on the aluminum plate 6. Since one side of the openings of the wells 2 is covered by the cover glass 4, the samples stored in the wells 2 may be retained.

Referring now to Fig. 10, an example of usage of the microplate 1 will be described.

In Fig. 10, sample containing liquid 7 in which a sample is mixed is injected into the wells 2 on the microplate 1. When performing fluorescent observation of this sample using, for example, an inverted fluorescent microscope, an objective lens 8 is arranged below the cover glass 4, and observation of the sample is carried out through the cover glass 4. Pure water 9 is injected between the objective lens 8 and the cover glass 4 when the objective lens 8 is an immersion lens.

The microplate 1 having the aluminum plate 6 sandwiched therein may be fabricated, for example, by injecting and molding plastic resin in a forming die in which the aluminum plate 6 is set to form the resin plate 3, and then adhering the cover glass 4 on one side of the surfaces of the resin plate 3.

A microplate formed with a metal plate sandwiched by plastic resin is disclosed, for example, in this

document.

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A gate for injecting plastic resin into a cavity of a forming die for the above-described resin plate 3 is arranged, for example, in the vicinity of the center of the surface of the resin plate 3.

When injection-molding of the resin plate 3 is performed using such a forming die, since the cooling speed of plastic resin is higher on the outer peripheral portion of the surface of the resin plate 3 than the center portion thereof, hardening of plastic resin starts earlier at the outer peripheral portion. Then, since plastic resin at the center of the surface of the resin plate 3 is pulled toward the outer peripheral portion due to shrinkage of plastic resin upon hardening, the outer peripheral portion of the surface of the resin plate 3 is mounded with respect to the center portion thereof, and consequently, a recess called "molding sink" is formed on the plate surface, and hence the flatness of the surface of the resin plate 3 is deteriorated.

Also, deformation of the resin plate 3 due to uneven shrinkage upon hardening of plastic resin may occur on the front and back surfaces of the resin plate 3. In the above-described forming die, since the gate for injecting plastic resin is disposed at the

above-described position, the cooling speed on the surface of the resin plate 3 formed of plastic resin is different between the surface on the side provided with the gate and the surface on the opposite side. Therefore, warping may occur on the resin plate 3 because hardening of plastic resin does not proceed uniformly on both surfaces of the plate, and hence the flatness of the plate surface may be deteriorated.

The warping may also occur when the density of plastic resin injected in the forming die is significantly different depending on the position of the forming die.

On the other hand, in the above-described microplate 1, the thickness of the cover glass 4 to be adhered to the resin plate 3 is generally very thin, and it may be broken when being deformed. Therefore, highly precise flatness is required for the adhesion surface of the light transmissible plate of the plastic resin plate.

In view of the problems described above, a problem to be solved by the present invention is to improve the flatness of the surface of the plastic resin plate, which includes a metal plate sandwiched therein and is formed into a microplate by adhering a light transmissible plate, to be adhered to the light transmissible plate.

Disclosure of Invention

A microplate according to the present invention has a plurality of wells for storing samples to be observed.

A microplate according to a first embodiment of the present invention includes wells formed by covering openings of through-holes with a light transmissible plate having a light transmissible property on one side, the through-holes being formed on a resin plate formed by covering a metal plate with plastic resin and extending through the resin plate including the metal plate, and is characterized in that an additional through-hole is formed on the surface of the metal plate within the well-formed range but at the positions where the wells are not formed.

In this structure, since the "additional through-hole" is formed on the surface of the metal plate within the well-formed range but at the positions where the wells are not formed, when plastic resin is injected from one side of the metal plate disposed in the forming die to fabricate the resin plate, melted resin passes through the "additional through-hole" and hence can easily be flown into the opposite area of the metal plate. Therefore, flowing balance of plastic resin in the

forming die at the time of injection-molding of the resin plate is uniformized, and hence flatness of the surface of the resin plate to be adhered to the light transmissible plate is improved.

In the microplate according to the first embodiment of the present invention described above, by employing an aluminum plate as the aforementioned metal plate, heating and cooling of the samples in the state of being stored in the microplate may be efficiently carried out owing to a good thermal conductivity of aluminum.

In the microplate according to the first embodiment of the present invention described above, by employing duralumin alloy as the aforementioned metal plate, efficient heating and cooling of the samples is enabled, and in addition, a high rigidity may be provided to the microplate.

In the microplate according to the first embodiment of the present invention described above, the resin plate is formed by injecting plastic resin from one side of the metal plate, and the additional through-hole may be provided at the position nearest to the position of injection gate of plastic resin when the resin plate is formed.

In this structure, when injecting plastic resin from one side of the metal plate disposed in the forming

die, flowing of the resin into the opposite area is significantly facilitated.

In the microplate according to the first embodiment of the present invention described above, since the wells are arranged at regular intervals in the vertical and lateral directions into a rectangular shape, and the aforementioned additional through-hole may be positioned at an equal distance from four wells provided in the vicinity of the additional through-hole.

In this structure, since flowing balance of plastic resin in the forming die for forming the four wells provided in the vicinity of the "additional through-hole" is uniformized, flatness of the surface of the resin plate to be adhered to the light transmissible plate is improved.

In the microplate according to the first embodiment of the present invention described above, a plural number of the aforementioned additional through-holes may be provided.

In this structure, when plastic resin is injected from one side of the meal plate disposed in the forming die, flowing of the resin into the opposite area of the plate is further facilitated.

In the structure described above, the resin plate is formed by injecting and molding plastic resin from

one side of the metal plate, and the size of the through-hole located at the position closest to the position of injection gate of plastic resin when forming the resin plate is larger than the other additional through-holes.

In this structure, when plastic resin is injected from one side of the meal plate disposed in the forming die, flowing of the resin into the opposite area of the plate is further facilitated.

In the aforementioned arrangement, the resin plate is formed by injecting-molding plastic resin from one side of the metal plate, and the sizes of the additional through-holes other than that formed at the position nearest to the position of injection gate of plastic resin when forming the resin plate may be increased with increase in the distance from the position of injection gate.

Flowability of resin is lowered with the distance from the position of injection gate of plastic resin since the temperature is lowered correspondingly. Therefore, by employing a structure in which the sizes of the "additional through-holes" on the metal plate is increased with increase in distance from the position of injection gate of plastic resin, sufficient flowing amount of plastic resin toward the opposite area may

be secured even though flowability is lowered.

The aforementioned structure may be such that the resin plate is formed by injecting and molding plastic resin from one side of the metal plate, the wells are arranged at regular intervals in the vertical and lateral directions into a rectangular shape, the additional through-holes provided at the positions other than the nearest position to the position of injection gate of plastic resin when forming the resin plate are displaced from the positions at equal distance from the four wells provided in the vicinity of the additional through-holes, and the amount of displacement of the positions is based on the distance from the position of injection gate.

Since the temperature goes down easily in the peripheral portion of the forming die used for injection-molding of the resin plate, the temperature of plastic resin in the corresponding portion is lower than the temperature thereof at the center of the forming die where plastic resin is injected. Therefore, flowability of resin is lowered with increase in distance from the center of the forming die. Accordingly, by arranging the "additional through-holes" which are disposed away from the position of injection gate of plastic resin at the positions displaced from the positions at equal distance from the four wells provided

in the vicinity of the "additional through-holes", flowing balance of plastic resin for forming the four wells is uniformized, and hence flatness of the surface of the resin plate to be adhered to the light transmissible plate is improved.

In the microplate according to the first embodiment of the present invention, the ends of the aforementioned additional through-holes may have a round shape.

In this structure, the round hole which can easily be formed by machining the metal plate may be used as the "additional through-holes".

In the microplate according to the first embodiment of the present invention, the ends of the aforementioned additional through-holes may be chamfered.

In this structure, flowability of melted plastic resin when passing through the "additional through-holes" may be improved.

A microplate according to a second embodiment of the present invention includes wells formed by covering openings of the through-holes with a light transmissible plate having a light transmissible property on one side, the through-hole being formed on a resin plate formed by covering a metal plate with plastic resin and extending through the resin plate including the metal plate, and is characterized in that at least one of the through-holes

provided on the metal plate passes through the plurality of wells.

In this structure, since a large through-hole of a size that can pass through the plurality of wells is formed on the metal plate, when injecting plastic resin from one side of the metal plate disposed in the forming die for forming the resin plate, melted resin passes through the large-sized through-hole and flows easily to the opposite area of the metal plate. Therefore, flowing balance of plastic resin in the forming die at the time of injection-molding of the resin plate is uniformized, and hence flatness of the surface of the resin plate to be adhered to the light transmissible plate is improved.

In the microplate according to the second embodiment of the present invention described above, the through-hole provided on the surface of the metal plate described above, which passes through the plurality of wells, may have a rectangular shape.

In this structure, even when a large through-hole is formed on the metal plate, it does not affect the arrangement of the wells, which are generally arranged at regular intervals in the vertical and lateral directions into a rectangular shape.

In the microplate according to the second

embodiment of the present invention described above, when duralumin alloy is employed as the metal plate described above, efficient heating and cooling of the samples are enabled, and lowering of rigidity of the microplate due to provision of the large sized through-hole may be reduced.

The microplate according to the second embodiment of the present invention described above may be constructed such that the aforementioned plate is formed by injecting and molding plastic resin from one side of the metal plate, and the sizes of the through-holes, which are formed on the surface of the metal plate so as to pass through the plurality of wells may be increased with increase in distance from the position of injection gate.

Flowability of resin is lowered with the distance form the position of injection gate of plastic resin since the temperature thereof is lowered correspondingly. Therefore, by employing a structure in which the sizes of the "through-holes passing through the plurality of wells" on the metal plate increase with increase in distance from the position of injection gate of plastic resin, sufficient flowing amount of plastic resin into the opposite area of the metal plate is secured even when flowability is lowered.

A method of forming a microplate including the steps of disposing the metal plate formed with the through-holes at the positions where the wells are formed and at the positions different from the positions where the wells are formed in the forming die, injecting and molding plastic resin from the position closest to one of the through-holes which are located at a position different from the positions where the wells are formed on the metal plate disposed in the forming die to form the metal plate into a resin plate covered with the aforementioned plastic resin and formed with the through-holes at the positions where the wells are to be formed, and adhering a light transmissible plate having a light transmissible property to one side of the resin plate to cover the through-holes formed on the resin plate on one side, thereby forming the wells, is also included in the present invention, and the microplate according to the first embodiment of the present invention described above may be manufactured by executing this manufacturing method.

A method of forming a microplate including the steps of disposing a metal plate formed with through-holes in a forming die, injecting and molding plastic resin in the forming die to form the metal plate into a resin plate covered with the aforementioned plastic resin and

formed with the through-holes, the meal plate including at least one through-hole passing through a plural number of through-holes provided on the resin plate, adhering a light transmissible plate having a light transmissible property to one side of the resin plate to cover the through-holes formed on the resin plate on one side, thereby forming the wells, is also included in the present invention, and the microplate according to the second embodiment of the present invention described above is manufactured by carrying out this manufacturing method.

According to the present invention, with any one of the embodiments described above, flatness of the surface of the plastic resin plate, which includes the metal plate sandwiched therein and is formed into the microplate by adhering the light transmissible plate, to be adhered to the light transmissible plate is improved.

Brief Description of Drawings

Fig. 1 is a drawing showing a first example of a microplate according to the present invention.

Fig. 2 is a drawing showing the structure of the aluminum plate used in the microplate shown in Fig. 1.

Fig. 3 is a drawing showing a second example of the microplate according to the present invention.

Fig. 4 is a drawing showing a third example of the microplate according to the present invention.

Fig. 5 is a drawing showing a fourth example of the microplate according to the present invention.

Fig. 6 is a drawing showing an example of the shape of a flow-through-hole in cross section.

Fig. 7 is a drawing showing a fifth example of the microplate according to the present invention.

Fig. 8 is a drawing showing the structure of an aluminum plate used in the microplate shown in Fig. 7.

Fig. 9 is a drawing showing an example of the structure of the microplate in the related art.

Fig. 10 is a drawing showing an example of usage of the microplate.

Best Mode for Carrying Out the Invention

Referring now to the drawings, an embodiment of the present invention will be described.

Fig. 1 shows a first example of a microplate according to the present invention, in which (a) is a partially enlarged top view of a microplate 1 according to the present invention, and (b) is a cross-sectional view taken along an alternate long and short dash line shown as C-C in (a), respectively.

The microplate 1 according to the present invention

includes cylindrical wells 2 arranged in rows and columns connected in a rectangular shape at regular intervals as in the related art shown in Fig. 9.

As shown in Fig. 1(b), it is also the same as the related art, shown in Fig. 9, in that a cover glass 4, which is a plate having a light transmissible property, is adhered to one side of a resin plate 3 with adhesive and hence the openings of the cylindrical through-holes provided on the resin plate 3 is covered with the cover glass 4 on one side, whereby the microplate 1 is formed.

The resin plate 3 is formed of resin 5, which is plastic material, and includes an aluminum plate 6, which is a metal plate having good thermal conductivity, disposed therein. In other words, the resin plate 3 is formed by covering the aluminum plate 6 with resin 5.

The structure of the aluminum plate 6 used in the microplate 1 shown in Fig. 1 will be shown in Fig. 2. The aluminum plate 6 is formed with through-holes (well through-holes 11) having a diameter larger than the inner diameter of the well 2 at intervals corresponding to the arrangement of the cylinders so as to prevent the aluminum plate 6 from being exposed inside the well 2 and coming into direct contact with the samples, and the cylinders formed by covering the aluminum plate 6 with resin 5 corresponds to the side walls of the wells

2.

The resin plate 3 having the aluminum plate 6 sandwiched therein as shown in Fig. 1 is formed by disposing the aluminum plate 6 in the forming die, and injecting and molding resin 5 from one side of the aluminum plate 6 in the forming die.

The aluminum plate 6 is characterized in that the through-hole referred to as flow-through-hole 12 is provided in addition to the well through-holes 11. Since the flow-through-hole 12 is formed on the aluminum plate 6, when resin 5 is injected from one side of the aluminum plate 6 disposed in the forming die when forming the resin plate 3, melted resin 5 can easily pass through the flow-through-hole 12 and flown into the opposite area. Therefore, flowing balance of resin 5 in the forming die at the time of injection-molding the resin plate 3 is uniformized, and hence flatness of the surface of the resin plate 3 to be adhered to the cover glass 4 is improved.

Preferably, the effect of the flow-through-hole 12 is remarkable when being disposed at the position closer to the position of injection gate (the position of the gate in the forming die) when injecting resin 5 into the forming die than any well through-holes 11 formed on the aluminum plate 6, more preferably, at the

positions nearest to the position of injection gate when the aluminum plate 6 is disposed at predetermined position in the forming die for forming the resin plate 3.

As the aluminum plate 6 shown in Fig. 2, so-called duralumin alloy (aluminum alloy containing copper, magnesium, manganese, etc.) may be employed instead of pure aluminum. By using duralumin alloy as the aluminum plate 6, rigidity of the resin plate 3 as well as the microplate 1 may be improved.

As illustrated in the partly enlarged top view of the microplate 1 in Fig. 1(a), the flow-through-hole 12 provided on the aluminum plate 6 is shown in the state of being viewed through the resin 5 having a light transmissible property and the flow-through-hole 12 is not required to be formed through the resin plate 3 itself. This is common in other examples of the microplate 1 according to the present invention described below.

Subsequently, Fig. 3 will be described. Fig. 3 shows a second example of the microplate 1 according to the present invention.

The example shown in Fig. 3 is characterized in that when the microplate 1 is formed, the flow-through-hole 12 is positioned at the same distance from any of the four wells 2 formed into a square shape

of two rows and two columns in the vicinity of the flow-through-hole 12, more specifically, is positioned at the center of gravity of the square having apexes at the centers of the four wells 2.

Since flowing balance of resin 5 in the forming die for forming the four wells 2 provided in the vicinity of the flow-through-hole 12 is uniformized by providing the flow-through-hole 12 on the aluminum plate 6 at the position described above, flatness of the surface of the resin plate 3 to be adhered to the cover glass 4 is improved.

It is also possible to provide a plural number of flow-through-holes 12 on the aluminum plate 6 described in conjunction with Fig. 1 or Fig. 3, and then flowing of resin 5 when being injected from one side of the aluminum plate 6 disposed in the forming die into the opposite area thereof is further improved.

In particular, in this case, out of the flow-through-holes 12 provided on the aluminum plate 6, the one disposed at the position nearest to the position of injection gate of resin 5 when the aluminum plate 6 is disposed at a predetermined position in the forming die for forming the resin plate 3 is preferably formed to have a diameter larger than those of other flow-through-holes 12. In this structure, when plastic

resin is injected from one side of the aluminum plate 6 disposed in the forming die, flowing of resin into the opposite area thereof may further be improved.

In the case where a plural number of flow-through-holes 12 are provided on the aluminum plate 6, the hole diameter of the flow-through-holes other than that disposed to the position nearest to the position of injection gate of resin 5 when the aluminum plate 6 is disposed at the predetermined position in the forming die for forming the resin plate 3 is preferably increased with increase in distance from the position of injection gate. Though flowability of resin 5 in the forming die is lowered with increase in distance from the position of injection gate of resin 5, a sufficient amount of resin 5 flowing into the opposite area of the aluminum plate 6 is secured even though flowability of resin 5 is lowered by determining the hole diameter of the flow-through-holes 12 provided on the aluminum plate 6 so as to increase with increase in distance from the position of injection gate of resin 5.

Also, in the case where a plural number of flow-through-holes 12 are provided on the aluminum plate 6, and the wells 2 are arranged at regular interval in the vertical and lateral directions into a rectangular shape on the microplate 1, the flow-through-holes 12

other than that disposed at the position nearest to the position of injection gate of resin 5 when the aluminum plate 6 is disposed at the predetermined position in the forming die for forming the resin plate 3 is preferably arranged at the position displaced from the position at an equal distance from the four wells 2 provided in the vicinity of the flow-through-holes 12. The microplate 1 in this structure will be described based on Fig. 4.

A third example of the microplate according to the present invention shown in Fig. 4 is characterized in that the position of the flow-through-hole 12 at an equal distance from any of the four wells 2 arranged into a square shape of two rows and two columns, which are formed on the microplate 1 so as to be close to each other, more specifically, the position of the center of gravity of the square having apexes at the centers of the four wells 2 is apart from a gate position 21 in the forming die having a gate from which resin 5 is injected by a distance L.

Since the temperature goes down easily in the peripheral portion of the forming die used for injection-molding of the resin plate 3, the temperature of resin 5 in the corresponding portion is lower than the temperature thereof at the center of the forming

die where resin 5 is injected. Therefore, flowability of resin is lowered with increase in distance from the center of the forming die. Accordingly, in Fig. 4, the flow-through-hole 12 is provided at the position displaced from the position of the center of gravity of a square having apexes at the centers of the four wells 2 on the aluminum plate 6. More specifically, with respect to the four wells 2, the flow-through-hole 12 is provided at the position closest to the upper right well 2 which is farthest from the gate position 21, second closest to the lower right well 2 which is second farthest from the gate position 21, third closest to the upper left well 2 which is third farthest from the gate position 21, and farthest to the lower left well 2 which is closest to the gate position 21. In this structure, flowing balance of resin 5 for forming the four wells 2 is uniformized and, consequently, flatness of the resin plate 3 on the surface to be adhered to the cover glass 4 is improved.

The amount of displacement of the position of the flow-through-hole 12 on the aluminum plate 6 is determined based on the distance L from the aforementioned gate position 21.

The flow-through-holes 12 on the aluminum plate 6 described above in conjunction with Fig. 1, Fig. 3,

or Fig. 4 are all through-holes of round shape. The reason why these flow-through-holes 12 are round in the aforementioned embodiments is because machining for providing the flow-through-hole 12 on the aluminum plate 6 is easy, and the shape of the flow-through-hole 12 is not limited. Among others, the shape of the flow-through-hole 12 may be formed into a shape shown in Fig. 5, that is, in the case where the flow-through-hole 12 is arranged at the position at an equal distance from any of the four wells 2 disposed in the vicinity of the flow-through-hole 12 into a square of two rows and two columns, the shape of the portion which is not included in circular arcs of the same radius from the four respective wells 2 may be employed as a shape of the flow-through-hole 12. In this structure, the distance from the respective portions of the wells 2 to the flow-through-hole 12 is equalized, and hence flatness of the surface of the resin plate 3 to be adhered to the cover glass 4 is further improved.

Since machining for providing the flow-through-hole 12 having the shape shown in Fig. 5, which shows the fourth example of the microplate 1 according to the present invention, on the aluminum plate 6 is difficult, it is also possible to form a through-hole of a square shape, which is relatively similar to the

shape of the hole described above, on the aluminum plate 6 as the flow-through-hole 12 to achieve the effect to further improve flatness of the surface of the resin plate 3 to be adhered to the cover glass 4 to a certain extent.

In addition, relating to the shape of the flow-through-hole, the flow-through-hole 12 may be formed into a tapered shape which is decreased in diameter toward the direction of flow of resin 5 as shown in (a) in Fig. 6, which shows examples of the shape of the flow-through-hole 12 in cross section. In this structure, flowability of resin 5 to the opposite area of the aluminum plate 6 may further be improved.

Also, as shown in Fig. 6(b), the end portion of the flow-through-hole 12 may be chamfered, and whereby flowability of resin 5 to the opposite area of the aluminum plate 6 may further be improved. Although the example in Fig. 6(b) shows a case in which the end portion of the flow-through-hole 12 is chamfered into a rounded shape, it may be chamfered into an angular shape.

Subsequently, Fig. 7 will be described. Fig. 7 is a fifth example of the microplate 1 according to the present invention, showing a partial cross-section of the microplate 1.

The microplate 1 includes the cylindrical wells

2 arranged in rows and columns connected in a rectangular shape at regular intervals as in the related art shown in Fig. 9.

It is the same in the structure as the related art shown in Fig. 9 in that the cover glass 4 is a plate having a light transmissible property is adhered to one side of the resin plate 3 with adhesive, and the openings of the cylindrical through-holes provided on the resin plate 3 are covered by the cover glass 4 on one side form the microplate 1.

The resin plate 3 is formed of resin 5, which is plastic material, and includes the aluminum plate 6 is a metal plate having good thermal conductivity disposed therein. In other words, the resin plate 3 is formed by covering the aluminum plate 6 with resin 5.

The structure of the aluminum plate 6 used in the microplate 1 shown in Fig. 7 will be shown in Fig. 8. The aluminum plate 6 is formed with through-holes (well through-holes 11) of larger diameter than the inner diameter of the well 2 at intervals according to the arrangement of the cylinders so as to prevent the aluminum plate 6 from being exposed inside the well 2 and coming into direct contact with the samples, and the cylinder formed by covering the aluminum plate 6 with resin 5 corresponds to the side walls of the wells 2.

The resin plate 3 having the aluminum plate 6 sandwiched therein as shown in Fig. 7 is formed by disposing the aluminum plate 6 in the forming die, and injecting and molding resin 5 from one side of the aluminum plate 6 in the forming die.

The characteristics describe above are the same as those of the aluminum plate 6 used for the aluminum plate 1 according to the first example of the microplate 1 of the present invention shown in Fig. 1 and according to the first example shown in Fig. 2.

The aluminum plate 6 shown in Fig. 8 is provided with the flow-through-hole 12 in addition to the well through-holes 11. The flow-through-hole 12 on the aluminum plate 6 shown in Fig. 8 differs from that shown in Fig. 2, and has a significant characteristic in that it has a diameter of the size that can pass through a plurality (two in the example in Fig. 7) of wells 2. Since the flow-through-hole 12 of such a size is provided on the aluminum plate 6, when resin 5 is injected from one side of the aluminum plate 6 disposed in the forming die when forming the resin plate 3, melted resin 5 passes through the flow-through-hole 12 and easily flown into the opposite area thereof. Therefore, flowing balance of resin 5 in the forming die at the time of injection-molding of the resin plate 3 is uniformized,

and hence flatness of the surface of the resin plate 3 to be adhered to the cover glass 4 is improved.

The flow-through-hole 12 provided on the aluminum plate 6 shown in Fig. 8 is a rectangular shape. It is because it does not affect the arrangement of the wells 2 which are arranged in the vertical and lateral directions at regular intervals into a rectangular shape, and is suitable for providing a large sized flow-through-hole 12, and it is not intended to limit the shape of the flow-through-hole 12 to the rectangular shape.

It is also possible to provide a plural number of flow-through-holes 12 as shown in Fig. 8 on the aluminum plate. In this case, the sizes of the flow-through-holes 12 preferably increase with increase in distance from the position of injection gate of resin 5 at the time when the aluminum plate 6 is disposed at the predetermined position in the forming die for forming the resin plate 3. As described above, since the temperature is lowered with increase in distance from the position of injection gate of resin 5 in the forming die due to lowering of temperature thereof, the sufficient amount of resin 5 flowing to the opposite area of the aluminum plate 6 may be secured by increasing the size of the flow-through-holes 12 to be provided on the aluminum

plate 6 as described above with increase in distance from the position of injection gate even when flowability of resin 5 is lowered.

The present invention is not limited to the aforementioned embodiments, and may be improved or modified without departing the scope of the invention.